



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,029	07/13/2005	Akihiro Masuda	050448	6762
23850	7590	09/18/2006		
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP 1725 K STREET, NW SUITE 1000 WASHINGTON, DC 20006				
			EXAMINER WONG, EDNA	
			ART UNIT 1753	PAPER NUMBER

DATE MAILED: 09/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/542,029

Applicant(s)

MASUDA ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :July 13, 2005 and October 6, 2005.

Claim Objections

Claim 1 is objected to because of the following informalities:

Claim 1

line 11, it is suggested that the word -- wherein -- be inserted before the word "the".

line 11, it is suggested that the word "being" be amended to the word -- is --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1

line 15, "the molecule" lacks antecedent basis. See also claim 1, line 17; claim 2, line 3; claim 3, line 3; claim 4, line 3; and claim 6, line 3.

Claim 5

lines 2-3, "the molecules" lack antecedent basis.

Claim 7

line 3, it appears that "an aliphatic sulfonic acid" is the same as that recited in claim 1, line 11. However, it is unclear if it is. If it is not, then what is the relationship between the aliphatic sulfonic acids.

Claim 8

line 3, it appears that "an aliphatic sulfonic acid" is the same as that recited in claim 1, line 11. However, it is unclear if it is. If it is not, then what is the relationship between the aliphatic sulfonic acids.

Claim 9

line 3, it appears that "an aliphatic sulfonic acid" is the same as that recited in claim 1, line 11. However, it is unclear if it is. If it is not, then what is the relationship between the aliphatic sulfonic acids.

Claim 10

line 3, it appears that "an aliphatic sulfonic acid" is the same as that recited in claim 9, line 3. However, it is unclear if it is. If it is not, then what is the relationship between the aliphatic sulfonic acids.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Plating Bath

I. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over **WO 00/31027 ('027)** and **Eiermann et al.** (US Patent No. 6,531,629 B1) in combination with **Nobel et al.** (US Patent No. 4,871,429).

Eiermann is the English equivalent of WO '027.

Eiermann teaches a tin-containing plating bath (= tin plating) comprising:

at least one aliphatic sulfonic acid selected from the group consisting of alkanesulfonic acids and alkanolsulfonic acids (= methanesulfonic acid) [col. 1, lines 6-13],

the aliphatic sulfonic acid being a purified aliphatic sulfonic acid in which the total amount of a sulfur-containing compound or compounds having one or more sulfur atoms with an oxidation number of +4 or less in the molecule (= dimethyldisulfide (DMDS) and S-methyl methanethiosulfonate) [col. 6, lines 32-36 and 41-44] and a sulfur-containing compound or compounds having one or more sulfur atoms and one or more chlorine atoms in the molecule is a minute amount or less (*inherent*) [= the already very pure alkanesulfonic acid obtained in the process can be purified in a downstream vacuum distillation column] (col. 5, lines 20-38).

The compound having sulfur atoms with an oxidation number of +4 or less in the molecule is dimethyldisulfide (col. 6, lines 32-36), and whose content in the plating bath is less than 200 ppm (*inherent*).

The compound having a sulfur atom with an oxidation number of +4 or less in the molecule is S-methyl methanethiosulfonate (col. 6, line 41-44), and whose content in the plating bath is less than 4 ppm (*inherent*).

The compounds having one or more sulfur atoms with an oxidation number of +4 or less in the molecule are dimethyldisulfide and S-methyl methanethiosulfonate (col. 6, lines 32-36 and 41-44); at least two sulfur-containing compounds selected from the group consisting of dimethyldisulfide, S-methyl methanethiosulfonate, α -chlorodimethylsulfone and α -methylsulfonyl- α , α -dichlorodimethylsulfone are present in the plating bath (= dimethyldisulfide (DMDS) and S-methyl methanethiosulfonate) [col. 6, lines 32-36 and 41-44]; and the total content of the sulfur-containing compounds in the plating bath is less than 2 ppm (*inherent*).

The alkanesulfonic acid is methanesulfonic acid (col. 1, lines 6-13).

The bath of Eiermann differs from the instant invention because Eiermann does not disclose the following:

a. A soluble stannous salt, or a mixture of a soluble stannous salt and at least one soluble salt selected from the group consisting of copper salts, bismuth salts, silver salts, indium salts, zinc salts, nickel salts, cobalt salts and antimony salts, as

recited in claim 1.

Eiermann teaches that short-chain alkanesulfonic acids, such as methanesulfonic acid, can, for example, be used as auxiliary chemicals for the electrodeposition of noble metals such as tin or lead in the tin plating of printed circuit boards for electronics or in the preparation of tinfoil (col. 1, lines 6-13).

Like Eiermann, Nobel teaches tin and tin/lead alloy electrodeposits useful for the electronic industry, particularly in the manufacture of printed circuit boards (col. 1, lines 27-32). Nobel teaches a soluble stannous salt (= tin can be added to the baths as a soluble alkyl or alkylolsulfonate salt) [col. 4, lines 10-17], or a mixture of a soluble stannous salt and at least one soluble salt selected from the group consisting of copper salts, bismuth salts, silver salts, indium salts, zinc salts, nickel salts, cobalt salts and antimony salts (= bismuth compounds) [col. 8, lines 12-27].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the tin plating bath described by Eiermann by using a soluble stannous salt, or a mixture of a soluble stannous salt and at least one soluble salt selected from the group consisting of copper salts, bismuth salts, silver salts, indium salts, zinc salts, nickel salts, cobalt salts and antimony salts because a soluble stannous salt would have been soluble in the alkyl or alkylol sulfonic acids (col. 4, lines 3-9) and the combination of an antioxidant with a metal sulfonic acid or sulfonate would have prevented or substantially retarded the oxidation of tin to tetravalent state and the corresponding formation of tin oxide sludge (col. 3, lines 41-45)

Art Unit: 1753

as taught by Nobel.

b. Wherein the compound having a sulfur atom and a chlorine atom in the molecule is α -chlorodimethylsulfone, and whose content in the plating bath is less than 4 ppm, as recited in claim 4.

c. Wherein the compound having sulfur atoms and chlorine atoms in the molecules is α -methylsulfonyl- α,α -dichlorodimethylsulfone, and whose content in the plating bath is less than 4 ppm, as recited in claim 5.

d. Wherein the compounds having one or more sulfur atoms and one or more chlorine atoms in the molecule are α -chlorodimethylsulfone and α -methylsulfonyl- α,α -dichlorodimethylsulfone; and the total content of the sulfur-containing compounds in the plating bath is less than 2 ppm, as recited in claim 6.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the compound described by Eiermann with wherein the compound having a sulfur atom and a chlorine atom in the molecule is α -chlorodimethylsulfone, and whose content in the plating bath is less than 4 ppm; wherein the compound having sulfur atoms and chlorine atoms in the molecules is α -methylsulfonyl- α,α -dichlorodimethylsulfone, and whose content in the plating bath is less than 4 ppm; and wherein the compounds having one or more sulfur atoms and one or more chlorine atoms in the molecule are α -chlorodimethylsulfone and α -methylsulfonyl- α,α -dichlorodimethylsulfone; and the total content of the sulfur-

containing compounds in the plating bath is less than 2 ppm because the specific species of sulfur-containing compound or compounds having one or more sulfur atoms and one or more chlorine atoms in the molecule would have been absent in the plating bath if its genus is absent in the plating bath.

The tin plating bath of Eiermann and Nobel would have comprised α -chlorodimethylsulfone and α -methylsulfonyl- α,α -dichlorodimethylsulfone in the plating bath of less than 4 ppm and of less than 2 ppm (= 0 ppm).

e. Wherein the purified aliphatic sulfonic acid is one obtained by purifying an aliphatic sulfonic acid which has been produced by subjecting alkyl mercaptan or dialkyldisulfide to wet oxidation or by hydrolyzing an alkylsulfonyl halide, as recited in claim 7.

f. Wherein the purified aliphatic sulfonic acid is one obtained by subjecting an aliphatic sulfonic acid to concentration under reduced pressure while heating, as recited in claim 8.

g. Wherein the purified aliphatic sulfonic acid is one obtained by subjecting an aliphatic sulfonic acid to solid phase extraction in which the aliphatic sulfonic acid is brought into contact with an adsorbent, as recited in claim 9.

h. Wherein the purified aliphatic sulfonic acid is one obtained by subjecting an aliphatic sulfonic acid to solid phase extraction at least twice, using the same or different kinds of adsorbents, as recited in claim 10.

i. Wherein the purified aliphatic sulfonic acid is one obtained by subjecting an aliphatic sulfonic acid to a combination of concentration under reduced pressure and solid phase extraction, as recited in claim 11.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because these claim limitations are not components of the plating bath (they are *process limitations*). Therefore, they fail to compositionally distinguish the plating bath from the prior art (MPEP § 2113).

Method

II. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over **WO 00/31027** ('027) and **Eiermann et al.** (US Patent No. 6,531,629 B1) in combination with **Nobel et al.** (US Patent No. 4,871,429) as applied to claims 1-12 above, and further in view of **IBM** (Technical Disclosure Bulletin, Vol. 32, No. 3B, August 1, 1989, pp. 36-37).

WO' 027, Eiermann and Nobel are as applied above and incorporated herein.

The method of Eiermann differs from the instant invention because Eiermann does not disclose wherein the tin plating of the printed circuit boards is a bump-forming method comprising forming a bump with the use of the plating bath of claim 1.

Like Eiermann, IBM teaches the electrodeposition of noble metals such as tin or lead in the tin plating of printed circuit boards for electronics (page 1). IBM teaches electroplating tin/lead eutectic solder 5 to make the Fig. 5 structure (pages 1 and 2).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to have modified the tin plating described by Eiermann to a bump-forming method comprising forming a bump with the use of the plating bath of claim 1 because depositing tin/lead as solder bumps on a printed circuit board would have attached a semiconductor device to the printed circuit board as taught by IBM (pages 1 and 2; and Figure 1).

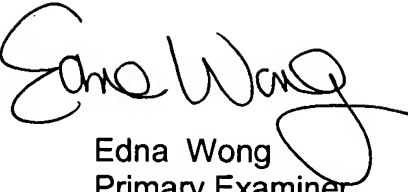
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/542,029
Art Unit: 1753

Page 11


Edna Wong
Primary Examiner
Art Unit 1753

EW
September 8, 2006